Chapter 3
PLANNING AREA DESCRIPTION

SUMMARY OF WATER RESOURCE SYSTEMS

Water for urban and agricultural uses in the LWC Planning Area comes from four main sources: the Floridan Aquifer System (FAS), the Intermediate Aquifer System (IAS), the Surficial Aquifer System (SAS), and surface water. Surface water is a major water supply source in the northern portion of the LWC Planning Area for agriculture and a few public water supply (PWS) utilities. However, ground water is the primary source of water for the rest of the LWC Planning Area. The SAS has been the principal ground water source except in the island communities of Lee County where the FAS is used. As the population in the LWC Planning Area increases, urban areas are anticipated to increase their use of FAS as a source of drinking water to meet these growing demands.

The SAS and surface water are dependent upon rainfall and Lake Okeechobee discharges to the Caloosahatchee River for recharge. The average annual rainfall in the LWC Planning Area is about 52 inches. Nearly two thirds of this rainfall occurs during the wet season months, from June through October. In addition to seasonal variation, rainfall varies significantly from year to year with historic annual amounts ranging from 30 inches to more than 86 inches in the LWC Planning Area. Rainfall also varies spatially, with rainfall amounts generally greatest in the south and west declining toward Lake Okeechobee in the northeast corner of the LWC Planning Area.

Surface water and ground water are highly interdependent. The construction and operation of surface water management systems affect the quantity and distribution of recharge to the SAS. Surface water management systems within the LWC Planning Area function primarily as aquifer drains, since the ground water levels generally exceed the ground surface elevations within the LWC Planning Area. The Caloosahatchee River and the Gulf of Mexico act as regional ground water discharge points (Wedderburn, et al., 1982).

Ground Water

The hydrogeology of South Florida is diverse. It includes aquifers that are confined, semi-confined (having some vertical recharge), and unconfined (ground water is at atmospheric pressure and water levels correspond to the water table). Within an individual aquifer, hydraulic properties and water quality may vary both vertically and horizontally. Because of this diversity, ground water supply potential varies greatly from one place to another.

The SAS may be divided into two aquifers, the water table and lower Tamiami, which are separated by leaky confining beds over much of the area. In northern Lee County, where the confining beds are absent or insignificant, the lower Tamiami is not a

separate aquifer but part of the unconfined water table aquifer. The thickness of the SAS ranges from more than 200 feet in central and southern Collier to four feet southwest of LaBelle in Hendry County. The SAS produces good quality water, except in areas near LaBelle and parts of the coast that have high concentrations of chlorides and dissolved solids, and isolated areas with high iron concentrations. Because it is close to the surface, this aquifer is easily recharged by local rainfall in the LWC Planning Area.

The lower Tamiami is the most prolific aquifer in Hendry and Collier counties. The lower Tamiami aquifer provides public water supply, domestic self-supply and landscape and agricultural irrigation uses. Because of the large demands on the aquifer, it has been endangered by saltwater intrusion on the coast, and is frequently included in water shortage declarations.

The IAS includes the Sandstone and mid-Hawthorn aquifers. The productivity of the Sandstone aquifer is highly variable. It is one source for public water supply in Lee County, but only marginally acceptable for potable uses in Hendry and Collier counties. Water from the Sandstone aquifer is suitable for irrigation purposes throughout its extent, with the exception of the LaBelle area, where it has been contaminated by flowing Floridan wells. In western Hendry County, where the lower Tamiami aquifer is absent, the IAS is an important source of water for agricultural irrigation, but is not capable of supporting large-scale agricultural operations in most areas.

Although present throughout the LWC Planning Area, the mid-Hawthorn Aquifer is not always productive. Its thickness is variable and relatively thin (it rarely exceeds 80 feet). This variability, combined with the presence of interbedded low permeability layers, results in low productivity of the aquifer. In addition to low productivity, the aquifer experiences degradation in water quality as it dips to the south and east, yielding only saline water in much of the LWC Planning Area.

The FAS, which underlies all of Florida and portions of southern Georgia and Alabama, contains several distinct producing zones, which are described by Wedderburn et al., 1982. Although it is the principal source of water in Central Florida, the FAS yields only nonpotable water throughout most of the LWC Planning Area. The quality of water deteriorates southward, increasing in hardness and salinity. Salinity also increases with depth.

The most productive zones of the FAS are the lower Hawthorn and Suwannee aquifers. Currently, the FAS supports several coastal PWS utilities. Improvements in desalination treatment technology will make development of these aquifers increasingly feasible. Portions of the producing zones also have potential for used by ASR projects. In the deeper producing zones of the FAS, there are areas of extremely high transmissivity. Although they are not used as supply sources within the LWC Planning Area due to the high salinity and mineral content, these formations serve other purposes. The lower portion of the FAS, a zone referred to as the "boulder zone", has been used for disposal of treated wastewater effluent and residual brines from the desalination process. The “boulder zone” is separated from upper portions of the FAS by confining layers that effectively separate the potential water resources from the injection zone.

The three major aquifer systems are summarized in **Tables 7**, **8**, **9**, **10**, and **11** in the Support Document by county for Charlotte, Collier, Glades, Hendry, and Lee. Appendix C includes a collection of ground water resources graphics as well as the temporal and physical relationships between these different aquifer systems. Information on ambient ground water quality, contamination sites, and saltwater intrusion is provided in Appendix G.

Surface Water

The Caloosahatchee River (C-43 Canal) flows east to west across the northern portion of the LWC Planning Area connecting Lake Okeechobee in the east and the Gulf of Mexico in the west. The southern portion of the LWC Planning Area has no major surface water features. The Caloosahatchee River is supplied by inflows from Lake Okeechobee and runoff from within it's own basin. As a result, water levels in the river are low during dry times, when demand is highest and the river is almost entirely dependent on Lake Okeechobee. However, during the rainy season, when demands are minimal, significant volumes of excess water are discharged into the Gulf of Mexico.

The Caloosahatchee River has been modified from its natural state into a navigable canal with three structures that control the flows from Lake Okeechobee. This canal is a major source of water for agricultural users in the canal basin as well as for two PWS systems.

SUMMARY OF NATURAL SYSTEMS

The natural systems within the LWC Planning Area consist of substantial areas of inland and coastal resources. A number of these systems are relatively pristine wetland areas and are recognized as having national importance. Before development of the region, inland areas were comprised of vast expanses of seasonally flooded wetlands, which experienced sheetflow of fresh water from the northeast to the southwest. Wetland areas serve as important habitat for a wide variety of wildlife and have numerous hydrological functions. **Plates 1** through **4** in the Support Document depict the many natural areas in the LWC Planning Area.

Inland Resources

Inland resources of the LWC Planning Area include numerous freshwater swamps, sloughs, and marshes. These include Lake Okeechobee, Caloosahatchee River and Estuary, Fred C. Babcock/Cecil Webb Wildlife Management Area, Telegraph Swamp, and Okaloacoochee Slough. In addition, the following systems are relatively pristine wetland areas that are recognized as having national and regional importance: Big Cypress National Preserve, Corkscrew Swamp Sanctuary, and Fakahatchee Strand.

Lake Okeechobee in the northeastern corner of the LWC Planning Area is the largest freshwater lake in the southeastern United States and is a major feeding and

roosting area for wading birds and migratory fowl. Discharges from Lake Okeechobee to the Caloosahatchee River and Estuary are a crucial component of the LWC surface water.

Coastal Resources

Description of Coastal Resources

Southwest Florida has some of the most pristine and productive coastal waters within the state. Five of these areas are contained in aquatic preserves, including Matlacha Pass, Pine Island Sound, Charlotte Harbor, Estero Bay, and Rookery Bay. The coastal resources include areas such as estuarine systems, barrier islands, and beaches.

Estuarine Systems

Coastal areas are dominated by large estuarine systems where the waters of the Gulf of Mexico mix with the freshwater inflows from numerous river systems, sloughs, and overland sheetflow. Two large open water estuarine systems, Charlotte Harbor and the Caloosahatchee Estuary, dominate the northwest portion of the LWC Planning Area. More than 40 percent of Florida's rare, endangered, or threatened species are found in Southwest Florida estuaries. Development of the watershed has changed the timing and quality of the freshwater flows to the estuary.

The Ten Thousand Island region, which dominates the southern portion of Collier County, is the largest protected mangrove forest in the world. These coastal mangroves, once commonly distributed along the entire coastline, serve as important nursery and feeding grounds and protect the shoreline against erosion from storms and high tides.

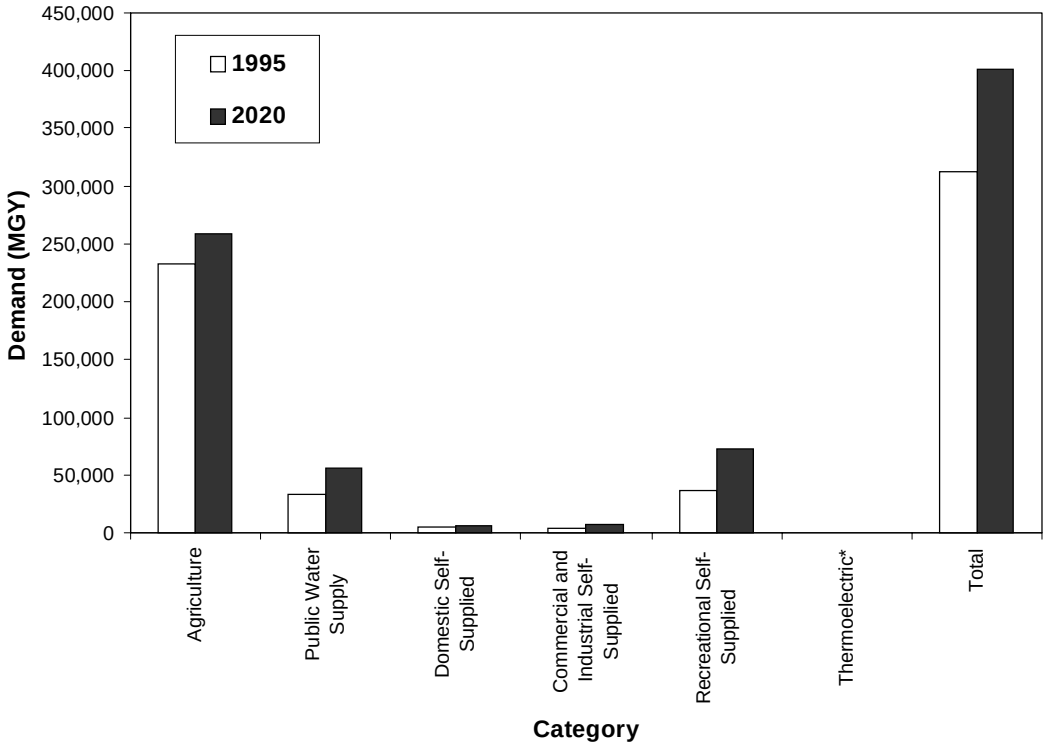
Barrier Islands

Barrier islands form a chain from northern Lee County to southern Collier County. Barrier islands protect the mainland from major storm events, act as a buffer for sensitive estuarine areas, and provide habitat for shorebirds and wildlife. These low lying, narrow strips of sand play an important role in the region's tourism economy by supporting tourism-related development and attracting visitors to the beaches.

LAND USE TRENDS AND WATER DEMANDS

Land use in the LWC Planning Area has been predominantly agricultural and is expected to remain so in the future (**Figure 3**). However, the percentage of agricultural land use in Collier and Lee counties is anticipated to decrease as a result of an increase in urban land use. Urban demands are concentrated in Lee and Collier counties, accounting for approximately 96 percent of the LWC Planning Area total population.

The water demand projections used in this plan are different than those presented in the 1995 Districtwide Water Supply Assessment (DWSA). The DWSA projections were updated with information that was published after completion of the DWSA for use



*281 MGY in evaporation losses, not circulation cooling demands.

Figure 3. Comparison of 1995 and 2020 Water Demands (MGY).

in this plan. From 1995 to 2020, the total average water demand is projected to increase by 28 percent from 312,954 to 401,548 million gallons per year (MGY), as shown in **Table 2**. Urban water demand in 1995 was estimated to be about 79,913 MGY, which is equivalent to 219 million gallons per day (MGD); this is projected to increase to almost 142,761 MGY (391 MGD) by 2020. In 1995, agriculture accounted for 74 percent of the total demand. Agricultural demands are projected to increase by 11 percent by 2020, accounting for 64 percent of the total demand in that year. Urban recreational self-supplied use, primarily golf courses, has the largest projected increase of 94 percent.

Table 2. Lower West Coast Population and Water Demands for 1995 and 2020 (MGY).

Category	Average Estimated Demands 1995	% of Total	Average Projected Demands 2020	% of Total	% Change 1995-2020	Projected 1-in-10 Demand 2020
Agriculture	233,041	74	258,787	64	11	306,978
Urban	79,913	26	142,761	36	79	158,522
Total	312,954	100	401,548	100	28	465,500
LWC Planning Area Population	**1995**		**2020**			
	590,939		992,805		68	